

United States Patent [19]

Williams et al.

Patent Number:

5,331,968

Date of Patent: [45]

Jul. 26, 1994

[54] INDUCTIVE PLETHYSMOGRAPHIC TRANSDUCERS AND ELECTRONIC CIRCUITRY THEREFOR

[76] Inventors: Gerald Williams, 485 Ridgewood Rd., Key Biscayne, Fla. 33149; Herman Watson, 105 11 S.W. 12 Ct., Miami, Fla. 33186; Marvin A. Sackner, 300 Rivo Alto Dr., Miami Beach, Fla. 33139; Chu Pak, 6525 Chapman Field Dr., Miami, Fla. 33156; James W. Chong, 10650 S.W. 69th Ave., Miami, Fla. 33156

[21] Appl. No.: 32,835

[22] Filed: Mar. 10, 1993

Related U.S. Application Data

[63]	Continuation of Ser. No. 601,168, Oct. 19, 1990, abandoned.

[52]	U.S. Cl.	 128/7	21; 128	3/722

[58] Field of Search 128/734, 721, 722, 716, 128/719, 670, 671

[56]

References Cited

U.S. PATENT DOCUMENTS

3,731,184	5/1973	Goldberg .	
4,308,872	1/1982	Watson et al	
4,373,534	2/1983	Watson	128/721
4,433,693	2/1984	Hochstein	128/721
4,452,252	6/1984	Sackner	128/671
4,494,553	1/1985	Sciarra	128/671
4,807,640	2/1989	Watson .	
4.815.473	3/1989	Watson et al	128/721
4.817.625	4/1989		
4.834.109		Watson .	
.,,	-, -, -,		

FOREIGN PATENT DOCUMENTS

2116725 9/1983 United Kingdom 128/721

OTHER PUBLICATIONS

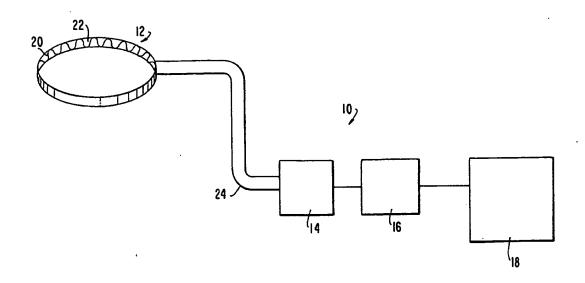
Respiratory inductance plethysmography with an electrical impedance plethysmograph, Sinton and Suntheratingam, Medical & Biological Engineering & Computing, Mar. 1988, pp. 213-217.

Primary Examiner—Lee S. Cohen Assistant Examiner—Robert L. Nasser, Jr. Attorney, Agent, or Firm-Cohen, Pontani, Lieberman, Pavane

[57] ABSTRACT

The present invention is an apparatus and method for improving the detection of the inductance "signal" generated by an inductive plethysmograph (12). Signal detection is improved by modifying the design of the inductive plethysmograph (12) and also by improving the design of the associated circuitry. By virtue of these improvements, the associated circuitry may be located remotely rather than on the transducer, as is the current practice. In one aspect of the invention, the impedance matching transformer (14) joining the inductive plethysmograph (12) to the oscillator (16) is selected such that the inductance of its primary winding is greater than about ten times the reflected inductance of the inductive plethysmograph (12) and the cable (24) joining it to the transformer (14). In accordance with another aspect of the invention, the inductive plethysmograph (12) is modified such that the conductor (20) incorporated therein encircles the relevant body portion a plurality of times. In yet a further aspect of the invention, the cable (24) connecting the inductive plethysmograph (12) to the transformer (14) is selected such that the ratio of the diameter of its screen to the diameter of its center conductor is minimized for reducing the inductance per unit length thereof.

31 Claims, 3 Drawing Sheets



08/05/2003, EAST Version: 1.04.0000